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Adjustment and Private Investment in Kenya

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Kenya's failure to implement adjustment policies after the collapse of the coffee boom and the breakup of the East African common market reduced private investment sharply in the 1980s. Efficient fiscal adjustment and more liberal imports will be critical to increasing private investment.

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Matin and Waso use an eclectic version of the basic accelerator model to assess the determinants of private investment and to analyze how adjustment policies (or their absence) affect those determinants. Their model emphasizes the effect of resource constraints on private investment behavior, including that arising from foreign exchange rationing.

Econometric estimation of the investment model with Kenyan data for 1968-88 suggests that Kenya's failure to implement adjustment policies after the collapse of the coffee boom and the breakup of the East African common market reduced private investment sharply in the 1980s. Declining real credit to private sector, falling stocks of public infrastructure capital, and lower availability of imports were the main causes of reduced private investment.

Matin and Wasow argue that inadequate fiscal adjustment was a key failure of policy. With direct competition between public and private sectors for limited financial resources, fiscal deficits preempted funds and restricted private investors' access to them. In addition, when cuts in government spending were undertaken to contain deficits, they fell disproportionately on capital expenditure, especially that on physical infrastructure. And liberalization of foreign exchange rationing, impeded by the exogenous fall in export receipts, could not be implemented because of inadequate fiscal adjustment. Thus insufficient and uncertain access to imports was a major factor behind the decline in private investment.

Though real depreciation is found to have a direct negative impact on investment, the authors use simulations to show that it has a positive indirect effect on private investment in the medium term because such depreciation relaxes the foreign exchange constraint on imports.

Matin and Wasow conclude that efficient fiscal adjustment and liberalization of imports will be critical for the recovery of private investment in Kenya. Efficient fiscal adjustment should reduce fiscal deficits so that expenditure cuts are structured to protect and even expand expenditure on physical infrastructure. This would require substantial reduction and rationalization of current expenditure. Import liberalization will also have the expected favorable impact on investment because such liberalization will be perceived as credible and sustainable when accompanied by efficient fiscal adjustment.

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I. INTRODUCTION

Many developing countries failed to maintain their investment rates in the 1980s. While adverse changes in the external environment has been important in some countries, adjustment policy aimed at restraining fiscal and current account deficits has been more important in others. In some countries private investment was 'crowded out' because the reduction in fiscal deficit was less than the reduction in external financing. In others, private investment was undermined because fiscal deficit reductions were not accompanied by equivalent reductions in current expenditure, resulting in declining public investment expenditure, especially on infrastructure. Similarly, attempts to reduce current account deficit without reducing fiscal deficit inhibited private investment because they made elimination of direct import controls difficult. Thus adjustment policies (or their absence) can influence private investment by affecting its key determinants.

Theoretical models of the determinants of private investment have been applied to developed countries with a fair degree of success (Bischoff, 1969, 1971; Clark, 1979; Eisner, 1970, 1972; Hines & Costepharous, 1970). Nevertheless, empirical studies have not yet clarified which of these models is a more accurate representation of the way in which capital formation occurs in developed countries. This is more true of developing countries where the assumptions underlying the standard optimizing investment models are usually not applicable.[1]

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[1]For example the absence of well-functioning financial markets, the relatively larger role of the government in capital formation, distortions created by foreign exchange constraints and other market imperfections are contrary to the assumptions. In addition there is little or no data on stock of capital, labor force and wages, real financing rates etc. necessary to

Empirical studies on the determinants of private investment in developing countries have been few and far between. Most of them have used a much more eclectic model of private investment designed to capture the distinctive institutional and structural features of those economies. They have combined the features of the flexible accelerator, neoclassical and structural models in an effort to emphasize the effects of resource constraints faced by private investors in developing countries. The results of those studies suggest that expected aggregate demand proxied typically by output, domestic credit constraint proxied by credit availability to private sector and physical infrastructure proxied by public investment expenditure are important determinants of private investment in developing countries (Sundrajan & Thakur 1980, TunWai & Wong 1982, Blejer & Khan 1984, Chhibber & Van Wijnbergen 1988, Musalam 1988, Shafik 1990, Schmidt-Hebbel and Muller 1991). Adjustment policies affect private investment because they affect those determinants.

This paper departs from the existing empirical literature on determinants of private investment in two ways. First, we incorporate the effect of changes in the restrictiveness of foreign exchange allocation and changes in the real exchange rate, both of which are generally part of adjustment programs. While the impact of real exchange rate on private investment has been explicitly investigated for several countries including Chile (Solimano 1989) and Indonesia (Chhibber & Shafik 1990), the effect of foreign exchange constraint has generally been ignored in the literature.[2] Second, we examine the determinants of private investment for a Sub Saharan

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implement those models empirically.

[2] The only two exceptions are Billsborrow's study of Colombian firms' investment behavior (Billsborrow 1977) and the multi-country study of private investment by Fry (1980).

African country, (a region that has been the focus of adjustment programs) by applying a model of private investment behavior to Kenya.[3] Kenya presents an interesting case to study private investment because it has experienced relatively greater macro-economic stability and because it has suffered large declines in investment in the 1980s notwithstanding adjustment efforts during 1979-82 and again during 1987-90.

The paper finds that declining availability of credit to private sector, falling stock of public infrastructure capital and the relatively lower level of import allocations relative to the 1970s are the main factors behind the decline in the rate of private investment in the 1980s. Adjustment policies or rather, Kenya's inability to implement them contributed to this decline. The nature of fiscal policies played a key role. It is thus argued that reversing those policies is critical to the restoration of higher rates of private investment. Money financing of fiscal deficit has to be reduced and current expenditure, especially wage expenditure, has to be cut so as to increase public capital expenditure, if private investment is to rise. Though import liberalization decreases uncertainty of access to imported goods, the absence of efficient fiscal adjustment raises questions of future access.[4] Notwithstanding the initial adverse effect of a real depreciation, it is found to have a favorable indirect impact on private investment in the long-run because it can relax the foreign exchange constraint and increase import allocations.

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[3]Note that the sample of 24 countries in Blejer & Khan (1984) did not include a sub-saharan African country.

[4]Attempts to liberalize imports in 1980 were aborted in 1983. The most recent efforts to liberalize began in 1987. Thus quantitative allocations of imports has dominated most of the period under study.

II. INVESTMENT TRENDS

Kenya's total real investment has been on a declining trend since 1971. The decline has been particularly severe after 1978 following the collapse of the coffee boom and the East African Common Market. Total real investment fell by 7 percent of GDP between 1978 and 1988.[5] As a share of real GDP, it was 10% in 1988 relative to 22% in 1971 and 17% in 1978.

Private real investment fell by 5 percent of GDP over the same period. (Figure 1). Private real investment was 5.8% of GDP in 1988 as compared to 14% in 1971 and 10.8% in 1978 (see Figure 1). This reduced the share of the private sector in Kenya's total investment from its peak of 63.6 percent in 1971 to around 50 percent in 1988.

Private investment in machinery and transport equipment has borne a disproportionate share of the burden of this decline. It has fallen from around 7 percent of GDP to 3.5 percent between 1978 and 1988 (see Figure 2). Thus the share of equipment in Kenya's private investment has declined from 66 percent to 61 percent over the same period.

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[5]This is estimated as the ratio of real investment to real GDP. Total real investment fell by 6.4 percent of GDP in the 1980s from an average of 17.4% of GDP in the 1970s (i.e. 1971-81) to an average of 11.0% in the 1980s (i.e. 1982-88). Private investment fell by 4.2 percent of GDP in the 1980s relative to the 1970s, as compared to a fall of 2.2 percent of GDP for public investment.

Figure 1

REAL FIXED INVESTMENT: 1966 – 1988

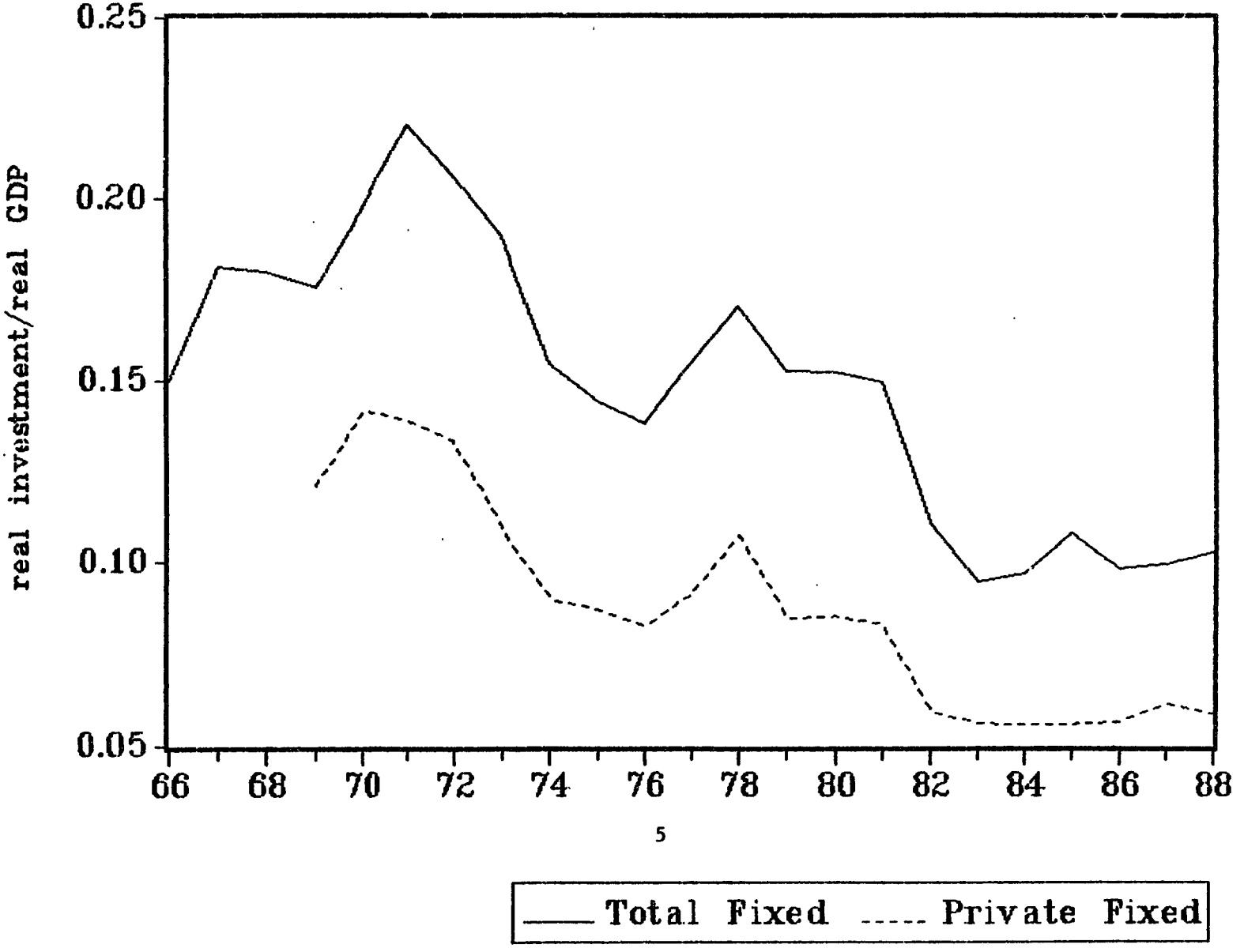

Figure 2

COMPONENTS OF PRIVATE INVESTMENT

III. DETERMINANTS OF PRIVATE INVESTMENT

The model of private investment applied to Kenya is an eclectic version of the flexible accelerator model[6] designed to capture some of the key determinants of private investment behavior. The basic accelerator model is modified to provide greater emphasis on the effects of resource constraints faced by private investors in developing countries. It is assumed that such constraints in respect of credit and foreign exchange affect the direction and speed of adjustment of actual capital stock to desired capital stock.

Estimation Model

In the long-run steady state, private sector's desired capital stock (K_t^*) is assumed to be proportional to expected output (Y_t^e):

$$(1) \quad K_t^* = a(Y_t^e)$$

There are two ways of deriving an investment function from the above equation (Blejer and Khan 1989). The first one specifies coefficient "a" as a function of different variables. Gradual adjustment of actual to desired capital stock is obtained in a standard way by using a local quadratic approximation to adjustment costs, and the gradual change in actual capital shock is the investment function.

The alternative method, the one we use for this paper, keeps "a" constant, but assumes that the parameters of the quadratic adjustment cost function are a function of different variables. This formulation starts with

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[6]Various problems restrict the applicability of a strictly neoclassical investment model to developing countries. See Footnote 1.

a partial adjustment function derived from a quadratic adjustment cost model as follows:

$$(2)\quad \Delta I_t = \beta (I_t^* - I_{t-1})$$

where I_t^* is the desired level of investment in the steady state, which is given by

$$(3)\quad I_t^* = [1 - (1-\delta)L] K_t^*$$

where L is the lag operator and δ is the proportional rate of depreciation.

The response of private investment to the gap between desired and actual investment, as measured by the coefficient β, is assumed to vary systematically with economic factors that influence the ability of private investors to achieve the desired level of investment.[7] Our hypothesis is that the response of private investors to that gap depends on five factors: (1) the availability of credit, (2) the availability of foreign exchange, (3) the real exchange rate, (4) the stock of public infrastructure capital and (5) macroeconomic instability.

[7]For example, the phenomenon of "crowding out" is captured through affecting the speed of adjustment rather than through directly changing the desired level of real private investment.

A clear consensus has emerged in recent years that, in contrast to developed countries, one of the principal constraints on investment in developing countries is the quantity, rather than the cost of credit. The rates of return on investment in these countries typically tend to be quite high, whereas real interest rates on loans are kept low by governments for a variety of reasons. In such circumstances the investor cannot be expected to equate the current marginal product of capital to its service cost. Indeed, because the total amount of financing is limited and the price mechanism is not allowed to operate smoothly, it would seem legitimate to argue that the private investor in a developing country is generally restricted by the level of available bank credit.[8] An increase in real credit to the private sector encourages real private investment as is confirmed by several empirical studies (Fry 1980, Tybout 1984, Blejer and Khan 1984).

In most developing countries, both the availability and the real price of foreign exchange affect private investment. This is because imports are often rationed and the cost of investment is influenced by the exchange rate and the uncertainty of access to foreign exchange.[9] If foreign exchange for imports is not available on demand at the prevailing exchange rate because of import rationing, then access to imports at a given exchange rate becomes

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[8]The rudimentary nature of capital markets in developing countries limits the financing of private investment to the use of retained profits and bank credit. Of these, the flow of bank credit to the private sector is likely to be quantitatively the most important.

[9]Several studies of developing countries have found that imports vary with the restrictiveness of import licensing which in turn varies with changes in stock of foreign exchange reserves (Hemphill 1980, Moran 1989). There is evidence that decisions of Government of Kenya on the restrictiveness of licensing is based on the size of reserves. For example in 1982/83 Kenyan government used an explicit "trigger mechanism" for moving items from restricted to unrestricted list. Movement of such items were triggered on reserve increases above 1.5 months import coverage.

uncertain. Increases in the restrictiveness of import rationing can reduce private investment in two ways. It can reduce private investment because of longer queuing time and/or greater uncertainty of access to capital goods imports. It can also reduce investment demand because the expected profitability of investment is lowered by similar uncertainty of access to intermediate imports. Billsborrow (1977) finds evidence of the effect of import allocations proxied by reserves on firm investment in Colombia.

Real depreciation affects private investment through several channels not all of which work in the same direction. First, real devaluation raises the cost of capital goods and acts like an adverse supply shock on investment, the size of which depends on the import content of investment (Buffie 1986, Branson 1986). Second, it raises the price of imported intermediate inputs. Both lower profitability of investment in the nontradable sector and thus slow down the adjustment response of private investment. On the other hand real devaluation can also raise investment by raising profitability of private investment in the tradable sector because it reduces the real product wage in terms of traded goods. Third, it raises demand for domestic output. Thus the net impact of real depreciation on private investment could go either way.[10]

This ambiguity is evident in empirical results. Most econometric studies find a negative impact of real depreciation on investment in the short-run but a positive impact in the long-run. For example, a short-run adverse effect is found by Musalam (1989) for Mexico, Solimano (1989) for Chile, Chhibber and Shafik (1990) for Indonesia. Faini and de Melo (1991)

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[10]If capital is not wholly immobile between sectors, then total investment demand may fall or rise (Lizondo and Montiel 1988) depending upon whether disinvestment in non-tradeable sectors is larger or smaller than the increase in investment in the tradeable sector.

using data for 24 countries confirm the same result. However all of the above find a positive impact of real depreciation over the longer run.

It is recognized that private and public investment are related. However, there is considerable uncertainty about whether, on balance, increases in total public sector investment raises or lowers private investment (Von Furstenberg and Malkiel 1977). Empirical evidence remains inconclusive. This is because public investment in production and in infrastructure can have opposite effects on private investment.

However, it is being increasingly acknowledged that public investment in infrastructure is more likely to be complementary to private investment because it raises the productivity of private capital. Several studies have examined this empirically (Aschauer 1990, Galbis 1979, Sundararajan and Thakur 1980, Blejer and Khan 1984, Chhibber and Van Wijnbergen 1988, Shafik 1991). Only a few studies do find evidence of a significant complementary relationship.[11] If public investment in infrastructure and private investment are complements, we would expect that the coefficient of adjustment of private investment would become larger as the rate of public investment in infrastructure increases, implying a faster response of private investment.

Macroeconomic instability is also expected to have an adverse effect on private investment, largely due to the uncertainty it creates in the adjustment process.

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[11]Sundararajan and Thakur (1980) found the coefficient of the public sector capital stock in the private investment equation to be statistically insignificant in both countries (India and the Republic of Korea) of their sample. Shafik (1991) confirms this for Egypt.

On the basis of the arguments above, we can express the coefficient of adjustment in equation (2) as a function of the following variables. A linear representation of this relationship would be

$$(4)\quad \beta_t = b_0 + \frac{1}{(I_t^* - I_{t-1})}\,(b_1 \Delta CR_t + b_2 FXRES_t + b_3 RER_t + b_4 KPU + b_5 VAR)$$

where

ΔCR = flow of real bank credit to the private sector

KPU= real public sector infrastructure capital stock

FXRES = stock of real foreign exchange reserves

RER = real exchange rate

VAR = macroeconomic instability proxied by variability of macrovariables like RER and inflation

Equation (4) states that the response of private investment to the size of the discrepancy between desired and actual investment depends on the magnitude of these five factors.[12] The signs of the parameters in this equation are expected to be:

$$b_1 > 0 \quad b_2 > 0 \quad b_3 \gtrless 0 \quad b_4 > 0 \quad b_5 < 0$$

Substituting equation (4) into equation (2) yields

[12]See Sundararajan and Thakur (1980) for a similar formulation.

$$(5)\ \Delta I_t = b_0 (I_t^* - I_{t-1}) + b_1 \Delta CR_t + b_2\, FXRES_t + b_3\, RER_t + b_4\, KPU + b_5\, VAR$$

From equations (3) and (1) we have

$$(6)\ I_t^* = [1 - (1-\delta)L]\, K_t^* = [1 - (1-\delta)L]\, aY_t^e$$

and, therefore, we can obtain a dynamic reduced-form equation for gross private investment that includes expected demand, the change in real bank credit, stock of real reserves, real exchange rate, the stock of public infrastructure capital and macroeconomic instability as the explanatory variables:

$$(7)\ I_t = b_0 a [1 - (1-\delta)L]\, Y_t^e + b_1 \nabla CR_t + b_2\, FXRES + b_3 RER + b_4 KPU + b_5\, VAR + (1 - b_0)\, I_{t-1}$$

IV. ECONOMETRIC ESTIMATION OF INVESTMENT MODEL

We estimate the investment model in equation (7) by ordinary least squares (OLS) and by two stage least squares (TSLS). They yield similar coefficient estimates. Unlike earlier studies we use a stock variable for infrastructure, since it is more likely that private investment is affected by changes in the stock of capital rather than the flow of public investment. Similarly, instead of using current receipts of foreign exchange or current foreign exchange reserves we use lagged reserves in order to avoid any simultaneity bias.

The results suggest that lower availability of credit to the private sector and falling public infrastructure capital stock has reduced private investment over the 1980s. Similarly, lower foreign exchange reserves in the years following the collapse of the coffee boom has lowered capital imports. The negative supply-shock effect seems to dominate the impact of real depreciation. There is also econometric evidence to suggest that inability to control fiscal deficit and its money financing, as well as failure to restrain current expenditure crowded out private sector credit and lowered public investment in infrastructure.

Estimation Results

Ordinary least square (OLS) and two stage least squares (TSLS) estimation used annual data on Kenya for the period 1968-1988.
To avoid spurious correlation and non-stationarity, the investment rate is used (i.e., share of investment in GDP) instead of the investment level. In

addition the real rate is used instead of the nominal investment rate.[13] In the case of TSLS the real exchange rate is instrumented by its lagged value and by the lagged value of real non-fuel exports.

(i) For Total Private Investment

All variables have the right sign in Table 2 and Table 3.[14] The real exchange rate and the lagged foreign exchange reserves proxying for access to imports are consistently significant at 1% level in all regressions.[15] So is real credit to private sector and public stock of infrastructure capital. The real interest rate, the index of macro instability and the lagged income growth rate variables are not significant. Specification (1) in Tables 2 and 3 which excludes them performs the best. Our confidence in this estimated private investment equation is supported by our tests for specification and stability.

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[13]Investment is expressed in real terms as is customary. Though some (Anderson 1981) have argued for using nominal values on the grounds that signals are transmitted in nominal terms and that it is difficult to represent the process by which these signals are translated from nominal into a real framework, most of their arguments are not relevant for Kenya. This is because Kenya has had a fairly steady rate of inflation and the private sector is likely to anticipate most price changes, whereas Anderson's nominal framework implies that all price movements are unanticipated.

[14]The matrix of correlations of the private real investment rate and each of the explanatory variables show only three variables to be highly correlated with the rate of real private investment with simple correlation of 0.8: the real exchange rate, the stock of foreign exchange reserves and the flow of foreign exchange receipts. These three variables all have strong time trends through the 1970s. Only one pair of explanatory variables is highly correlated, namely the current stock of foreign exchange reserves and the current real exchange rate probably suggesting that devaluations have been reserve driven contemporaneously. However, lagged reserves are not so correlated.

[15]The stock of foreign exchange reserves performs better as a proxy for restrictiveness of licensing than the flow of foreign exchange receipts. The "t" statistic of all coefficients is higher, and the fit of the entire equation is improved. All equations that include reserves and the real exchange rate have adjusted R-squared of above 0.9.

Table 2. OLS Estimation Results for Private Investment Function

	Dependent variable is real private investment/real GDP			
	(1)	(2)	(3)	(4)
Constant, C(1)	-2.406	-4.019	-2.390	-3.790
Real Rate of Interest, C(2)	--	-0.849*		-0.769*
		(-2.08)		(-1.82)
Flow of real credit to private sector as a ratio to GDP, C(2)	0.065***	--	0.062***	--
	(4.02)		(3.80)	
Foreign Exchange Reserves as a ratio to GDP, C(3) (2 year sum, lagged 1 period)	0.332***	0.353***	0.326***	0.350***
	(7.98)	(7.44)	(7.82)	(6.65)
Real Exchange Rate, C(4) (Trade weighted, 1985 = 100)	0.460***	0.607***	0.452***	0.557***
	(3.52)	(4.35)	(3.48)	(3.19)
Infrastructure Public Capital stock as a ratio to GDP, C(5)	1.073***	0.516	1.102***	0.562
	(2.95)	(1.33)	(3.05)	(1.37)
Lagged GDP growth rate C(6)	--	--	0.994	1.270
			(1.13)	(1.13)
R-BAR SQUARED	0.96	0.93	0.96	0.93
F-STATISTIC	103.8	69.0	84.0	50.5
DURBIN-WATSON	1.41	1.69	1.42	1.80
N	20	20	20	20
White Statistic	1.432	--	5.771	--

Note: 1. All variables are in natural log.

2. The sample includes annual data from 1969 to 1988.

Table 3: TSLS Estimation Results for Private Investment Function

	Dependent Variable is Real Private Investment/Real GDP			
	(1)	(2)	(3)	(4)
Constant	-2.414	-3.560	-2.470	-3.57
Real Rate of Interest		-0.785*		-0.733*
		(1.84)		(-1.80)
Flow of Real Credit to private sector as ratio to GDP	0.065***		(3.80)	0.062***
	(4.02)			
Foreign Exchange Reserves as a Ratio to GDP (2 Year Sum lagged 1 period	0.332***	0.376***	0.323***	0.360***
	(7.66)	(6.80)	(7.46)	(6.54)
Real Exchange Rate (Trade Weighted 1985=100)	0.462***	0.502**	0.467***	0.508***
	(3.25)	(2.63)	(3.72)	(2.70)
Infrastructure Public Capital Stock as ratio to GDP	1.073**	0.467	1.100***	0.547
	(2.95)	(1.13)	(3.05)	(1.33)
Lagged GDP Growth rate	--	--	0.988	1.303
			(1.12)	(1.15)
R-BAR SQUARE	0.96	0.93	0.96	0.93
DURBIN WATSON	1.31	1.68	1.42	2.00
N	20	20	20	20

All variables are in logs. The real exchange rate is instrumented by lagged real exchange rate, and lagged real non-fuel exports. Data in parenthesis are the t-statistics.

The lagged GDP growth variable is insignificant; so are all other conventional proxies for expected demand. Its exclusion from the regression improves the precision of other coefficient estimates without reducing the overall explanatory power of the equation (compare specifications (1) and (2) with (3) and (4) in Tables 2 and 3 (not shown in Table 2 or 3). This suggests within-year adjustment of capital stock.

Real interest rate is significant only at the 5% level. However its introduction makes the coefficient for infrastructure capital stock less precise and the private investment function less stable. Further, as we show later the real rate of interest is not significant when the equations explaining the differing components of private investment viz: equipment and buildings investment are estimated separately. Furthermore when interest rate variable is replaced by the flow of credit to private sector as is done in specifications (1) and (3), the explanatory power of the investment function rises and all coefficients are significant at 1% level.[16] This is perhaps not surprising given that interest rates were administratively controlled in Kenya during this period. Changes in domestic money financing of fiscal deficit were thus reflected in changes in credit to private sector than in interest rates.

Relaxation of import access (proxied by higher lagged reserves in the equation) raises private investment but real depreciation reduces it.[17] The

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[16]A visual inspection of the recursive coefficient plots show that all the four coefficient estimates for the equations that includes the rate of interest variable are more unstable relative to the equation that includes bank credit.

[17]Branson using Kenyan parameters simulates the impact of devaluation on investment and concludes that investment falls due to the supply shock effect of devaluation. (Branson 1986)

elasticity of the private investment rate with respect to reserves is around 0.35 and that with respect to the real exchange rate is in the range of 0.46 to 0.6.

The elasticity of private investment with respect to credit availability is significant in all regressions. It is worth noting that this captures changes in credit mainly for working capital and thus ignores the constraints on term credit for investment. The elasticity implied by the results is thus likely to be an underestimate of the total effect of credit availability.[18]

There is a strong complementary relationship between the stock of public infrastructure capital and private investment. Private investment is unit elastic with respect to infrastructure. Thus reductions in government investment expenditure on infrastructure, is likely to affect private investment with a lag since it will take time to affect shock of capital. Efforts to restrain total public expenditure will thus affect private investment adversely if it reduces public investment in infrastructure and reduces the stock of infrastructure capital.

While we can read off the relevant elasticities from the coefficient estimates in Tables 2 and 3, the relative importance of each variable as a determinant of private investment is not obvious because of differences in the units of the explanatory variables. We thus compute standardized betas (Theil 1980) for each of the coefficients in two best specifications to indicate the relative importance of each variable in determining private investment. Table 4 reports the results.

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[18]We could not obtain time series data on medium term credit availability, which is likely to be a better determinant of investment.

Table 4. Beta Coefficients of Private Investment Function
(Excluding interest rate variable)

Variables	Betas	
	Specifications	
	(1)	(3)
Flow of Real Credit	0.256	0.280
Foreign Exchange Reserves	0.619	0.648
Real Exchange Rate	0.273	0.266
Infrastructure Capital Stock	0.182	0.181
Income Growth	--	0.092

Source: Computed from Table 2

In relative terms, changes in lagged foreign exchange reserves or rather in the changes in restrictiveness of import access has the greatest impact on private investment. Flow of real credit to private sector and real exchange rate changes come next. Though infrastructure capital stock had the highest value for elasticity (see Table 2 and 3) and flow of real credit the lowest, the relative importance of credit as a determinant of private investment is greater that infrastructure capital stock. Lagged income growth has the weakest effect.

(ii) Components of Private Investment

Tables 5 and 6 reports the results of both OLS and TSLS estimation for the two components of private investment. The response of each of the two major components of private investment (i.e., equipment and buildings) to changes in reserves and in the real exchange rate are similar in both size and significance to that for total private investment. The same is not true for the other determinants.

Table 5. OLS Estimation Results for Components of Private Investment

Dependent variable is Real Priv. Investment/GDP in:	Buildings		Equipment	
	(1)	(2)	(3)	(4)
Constant	-4.080	-3.826	-2.639	-2.637
Flow of real credit to private sector as a ratio to GDP	-0.014		0.106***	0.105***
	(-0.72)		(3.90)	(3.76)
Foreign exchange reserves as a ratio to GDP (2-year sum, lagged 1 period)	0.319***	0.308***	0.326***	0.325***
	(6.75)	(6.94)	(4.67)	(4.46)
Real exchange rate (trade weighted, 1985 = 100)	0.458***	0.456***	0.519*	0.518**
	(3.11)	(3.14)	(2.36)	(2.28)
Public infrastructure capital stock as a ratio to GDP	0.825*	0.979**	1.422*	1.426*
	(2.01)	(2.80)	(2.33)	(2.25)
Lagged growth of GDP	1.872*	1.74*		0.149
	(1.88)	(1.80)		(0.09)
R-BAR SQUARED	0.92	0.92	0.91	0.90
F STATISTIC				
DURBIN-WATSON	2.27	2.24	1.96	0.97
N	20	20	20	20

Notes:
1. All variables are in natural logs and the interest rate variable is dropped as it is insignificant at 10%.
2. The sample includes annual data from 1969 to 1988.

Table 6. TSLS Estimation Results for Components of Private Investment

Dependent variable is Real Priv. Investment/GDP	Buildings		Equipment	
	(1)	(2)	(3)	(4)
Constant	-4.699	-4.806	-2.416	-2.396
Flow of real credit to private sector as a ratio to GDP	-0.014	--	0.106***	0.106***
	(-0.75)		(3.70)	(3.91)
Foreign exchange reserves as a ratio to GDP (2-year sum, lagged 1 period)	0.291***	0.264***	0.335***	0.337***
	(5.79)	(5.83)	(4.42)	(4.63)
Real exchange rate (trade weighted, 1985 = 100)	0.586***	0.672***	0.472*	0.469*
	(3.59)	(5.13)	(1.92)	(1.97)
Public infrastructure capital stock as a ratio to GDP	0.845*	1.049**	1.419**	1.413**
	(2.01)	(2.89)	(2.24)	(2.31)
Lagged growth of GDP	1.826*	1.586	0.166	--
	(1.78)	(1.58)	(0.11)	
R-BAR SQUARED	0.92	0.92	0.90	0.91
F STATISTIC	43.4	58.8	34.9	46.7
DURBIN-WATSON	2.29	2.15	0.98	0.97
N	20	21	20	20

Though public infrastructure capital stock is significant for both components of private investment, the coefficients are significantly higher for equipment investment. This is quite plausible since manufacturing dominates equipment investment and the profitability of manufacturing investment appears to be more dependent on infrastructure. On the other hand, changes in the availability of credit does not affect buildings investment. This is surprising. One possibility is that it reflects the effect of restrictions on credit flows to housing and real estate investment. However,

given what we know about the fungibility of credit in Kenya, this is not plausible. The other possibility is that these investors use their own retained earnings because it is a useful way of understating taxable earnings. In any case it appears from the data that the impact of private sector credit availability on total private investment arises from its effect on equipment investment.[19]

Adjustment Policies Affecting Private Investment

Fiscal policy, nominal exchange rate policy and trade policy constitute the core components of most adjustment programs. Changes in these policies affect credit availability, infrastructure investment and reserves which in turn affect the speed and direction of investor response to the gap between actual and desired capital stock.

[19]Again, this may be because most capital equipment are imported and the process of importing is highly credit-intensive because of the time-consuming process of importing.

At the simplest level, an increase in fiscal deficit without additional inflow of foreign savings, must lead to either an increase in private savings or a decrease in private investment.[20] How much of the change is borne by a decrease in private investment depends on how fiscal deficits affect the availability of credit to the private sector.[21]

A clear negative relationship between bank credit to private sector and the size of the fiscal deficit and/or by flow of real credit to public sector which finances the fiscal deficit establishes the empirical link between fiscal policy and private investment. Table 7 provides results of regressions that attempt to estimate the link between fiscal policy and real credit to private sector.

---

[20]This is evident from the standard national income identity.

$(G-T) = (S_p - I_p) + (M-X)$

Fiscal deficit = net private savings + foreign savings

[21]Probably the most powerful instrument through which credit to private sector is crowded-out is the use of ceilings on total bank credit and on credit to government. Credit to the private sector is residually determined after accommodating the financing needs of the government. Central Bank's control over the minimum levels and composition of liquid reserves of commercial banks and non-bank financial institutions provide another instrument for channelling credit to government in Kenya.

Table 7: Fiscal Deficit and Private Sector Credit

Dependent Variable	Real Private Sector Credit as Share of GDP		Real Credit to Private Sector
	1968-88 (1)	1974-88 (2)	1968-88 (3)
1. Constant	-0.69	-1.42	-1831.5
2. Fiscal Deficit/GDP	-0.39** (2.26)	--	--
3. Growth of GDP	25.7* (1.92)	--	--
4. Real Credit to Public Sector/GDP		-0.52** (2.11)	
5. Real Lending Rate			-644.4** (-1.95)
6. Real Credit to Public Sector		--	-0.41** (-2.03)
7. Real GDP		--	0.07*** (2.91)
Adjusted $\bar{R}^2$	0.39	0.45	0.68

All coefficients related to the financing of fiscal deficit confirm the "crowding out" effect of increased fiscal deficit. Thus if fiscal adjustment is successful in reducing deficits, the availability of credit to private sector will improve and private investment will rise. However, if reduction in deficit is undertaken through reduction in expenditure and this is disproportionately borne by government's investment expenditure especially on infrastructure, as has happened in Kenya private investment will fall.

Nominal exchange rate actions and fiscal policy, especially changes in level and composition of government expenditure affect the real exchange rate. Changes in nominal exchange rate is often an integral part of adjustment programs for purposes of altering the real exchange rate. Since countries like Kenya import the bulk of their machinery and equipment for investment, the cost of investment depends on the relative price of investment good imports. The elasticity of the relative price of investment goods with respect to the real exchange rate has been important in many countries (Faini and de Melo 1991). The result for Kenya is shown in Table 9.

Table 9. Relative Price of Investment Goods and the Real Exchange Rate

(1968--1988)

Dependent Variable: Investment Deflator/GDP Deflator

	(1)	(2)
Constant	5.257	1.987
Real Exchange Rate	-1.127***	-0.422***
	(-9.79)	(-1.96)
Construction Price	--	1.042***
		(3.08)
Adjusted R	0.83	0.91
Durbin Watson Statistic	1.42	1.92
AR (1)	-	0.342
		(1.48)

Notes: All variables are in logs and data in parenthesis show the t-statistics. Construction price is the ratio of construction deflator to GDP deflator and real exchange rate is 1985 trade weighted (top 20 partner) index.

The results suggest that a real depreciation will have a substantial adverse effect on private investment in the short to medium run by raising the cost of capital. However, this adverse effect must be balanced against

whatever efficiency-enhancing effect results from lower distortion in the price of investment goods.

In Kenya's case there is also some evidence (specification 2) that domestic price of construction has also raised the relative price of investment goods. This is consistent with other studies of Kenya's coffee boom (Bevan et al) where they find that accelerated increases in domestic investment financed by coffee boom revenues raised the price of construction due to low short-run price elasticity in this sector.

V. MODEL APPLIED: POLICY SIMULATIONS

Since the coffee boom of the 1970s virtually all factors have worked against private investment. Thus policy simulations confirm that if policies involving money financing of deficit and public investment were unchanged relative to 1978, Kenya would have had substantially higher private investment rates in the 1980s. However, if reserves fell as it actually did, private investment would remain considerably lower notwithstanding fiscal adjustment. It is a moot point whether reserves would decline as much as it did if fiscal adjustment was successful. Policy simulations also show that though real depreciation has an adverse direct effect on private investment it has a favorable indirect effect in the medium term, because depreciation helps to relax the foreign exchange constraint.

Fiscal Policy and Import Liberalization

Fiscal policy directly affects two of the determinants of private investment in Kenya: credit availability to private sector and public stock of infrastructure capital.[22] Policy simulations (using equation (1) of Table 3 and unchanged 1978 values for credit and infrastructure) show that private investment in the 1980s (e. g. 1982-88) would, on average, have been around twenty three percent higher than they were in that period if these two fiscal variables had maintained their 1978 levels in the 1980s. Figure 3 shows that

[22]By applying the estimated coefficients from equation (1) to the actual values of real private sector credit and infrastructure capital stock, we find that around two-fifth of the decline in private investment between 1978 and 1988 is explained by these two variables.

SIMULATION WITH CONSTANT FISCAL POLICY

(Simulations: 1978 – 1988)

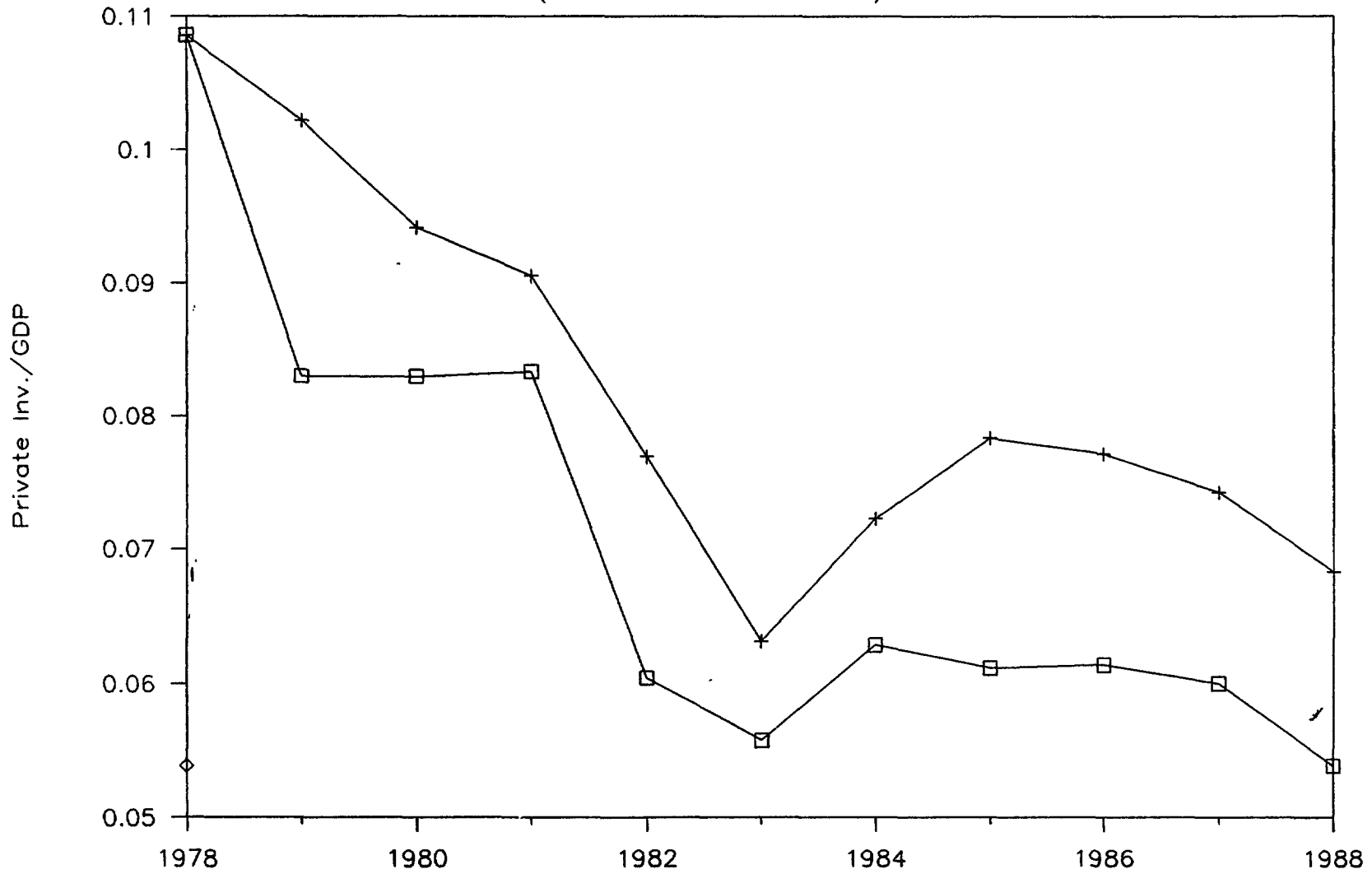
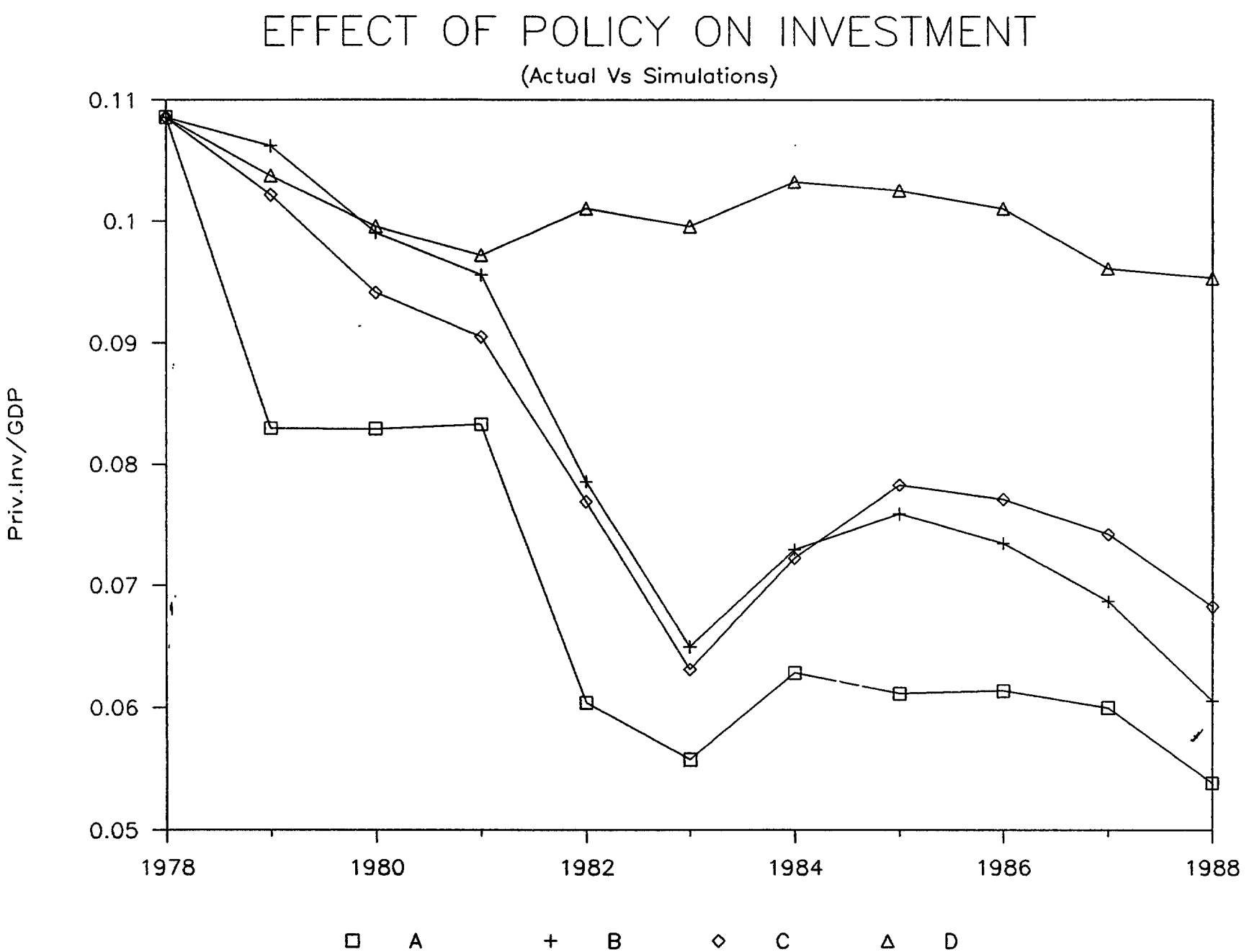


Figure 4


EFFECT OF POLICY ON INVESTMENT
(Actual Vs Simulations)
Priv.Inv/GDP
0.11
0.1
0.09
0.08
0.07
0.06
0.05
1978
1980
1982
1984
1986
1988
A
B
C
D

restoring availability of credit to the private sector has a dominant effect, both because it is a relatively more important determinant of Kenyan private investment and because it declined substantially in the 1980s. Thus if Kenya had succeeded in adjusting i.e. in restraining money-financing of fiscal deficit and in controlling expansion of current expenditure at the cost of capital expenditure, private investment would have fared better.

Figure 4 helps to highlight the fact that appropriate fiscal adjustment (e.g. 1978 would not be sufficient to raise investment to 1980 levels). The simulations show what would have happened to investment as both fiscal policy variables are restored to their 1978 level. For example private investment rate in 1985 could be nearly twice the actual rate of 5.5% of GDP: with only real credit to private sector maintained at 1978 level. Private investment rate would be 7.3% (line B), with both credit and infrastructure maintained (i.e. graph C if fiscal adjustment succeeded in maintaining them) instead of the actual of 5.5% shown in base run A.

Enhanced import allocations proxied by reserves at levels of 1978 would make the largest contribution to restoring investment rates. Difference between Graphs C and D in Figure 4 shows the size of this contribution. In 1985, it could raise investment from 7.8% to 10.5% of GDP.

Impact of Real Devaluation

Though the sign of real exchange rate in the private investment equation is negative, policy simulations suggest that the overall effect of real depreciation in the medium-term would be favorable. The favorable indirect effect arises from the relaxation of foreign exchange constraint that occurs

due to depreciation-induced improvement in trade balance. A simultaneous equation model would have captured this indirect effect easily.

In its absence, we try to capture this in an ad hoc manner. Real depreciation affects both export supply and import demand, the magnitude of which depend on their price-sensitivity. This influences trade balance and thus foreign exchange reserves.[23] We use the estimated export supply and import demand equations shown in Table 10 in conjunction with the estimated private investment function to simulate the effects of real depreciation.

Figure 5 compares the behavior of private investment under one-shot and gradual real depreciation. The no depreciation (baseline) scenario captures essentially the effect of lagged reserves. The one-shot 15% real depreciation in year T and the gradual[24] 15% real depreciation equally phased over three years (T, T+1 and T+2) are shown (see Figure 5).

---

[23]Most of the positive effects of real depreciation on reserves comes out of decreases in total non-fuel imports. This is because price elasticity of exports is much lower than imports. Given Kenya's past policy regime and the resulting predominance of relatively inelastic exports (e.g., coffee, tea, sisal) in Kenyan exports, this is not surprising. The net effect of depreciation on imports is adjusted for the increase in imports that results from higher export earnings and reserves.

[24]Since real depreciation is a function of nominal depreciation and domestic fiscal monetary policy stance, gradual real depreciation could also be viewed as slow "pass through" of a large nominal devaluation.

Real Depreciation and Investment

Sudden vs. Gradual Depreciation

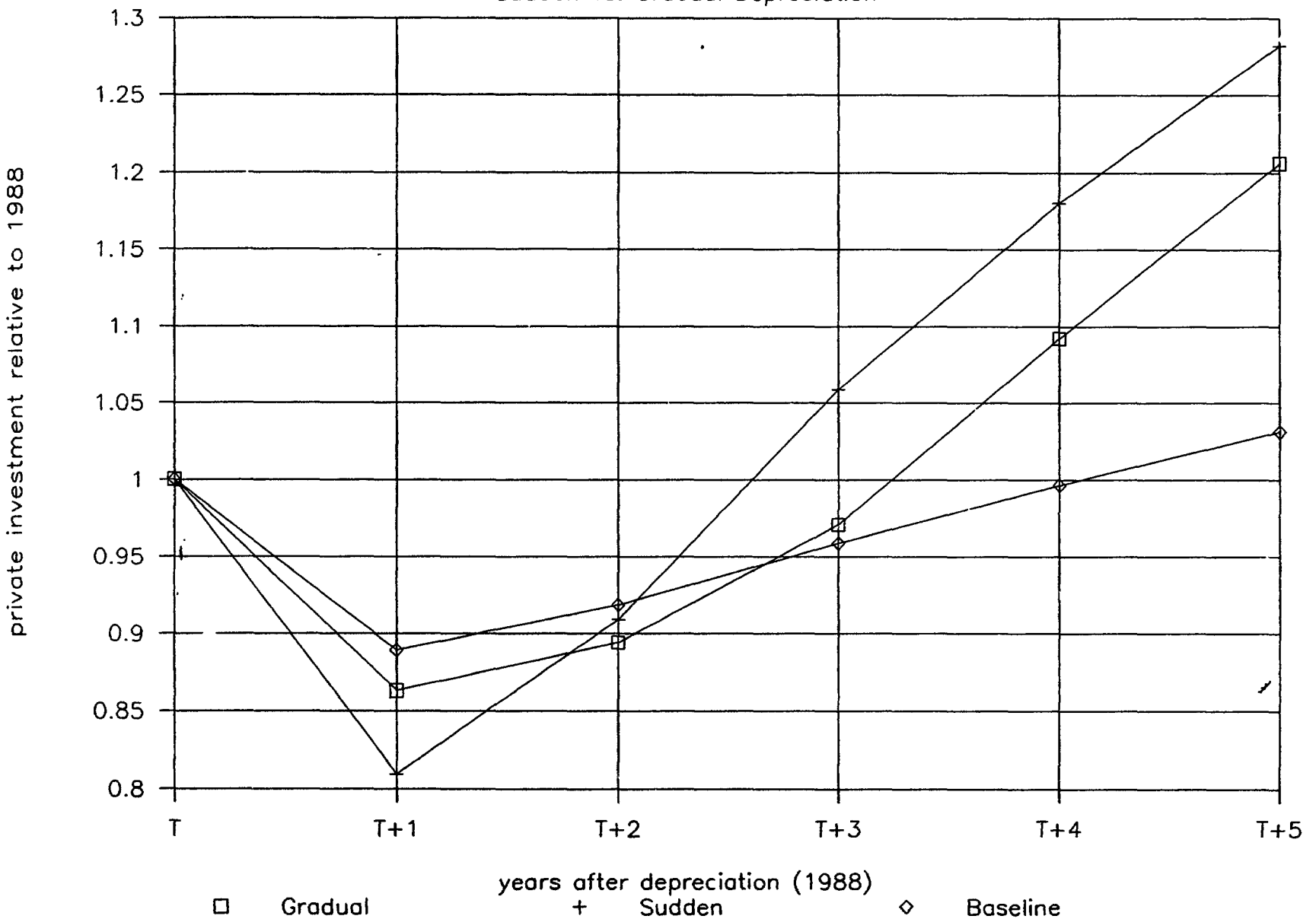


Table 10: Estimated Export Supply and Import Demand Functions

Dependent Variable	Real Non-Fuel Exports	Real Non-Fuel Imports
Sample	1967 to 1988	1966 to 1988
Constant	9.107	0.724
Export Price/GDP Deflator (t-1)	0.135* (1.675)	
Import Price/GDP Deflator		-1.135*** (3.56)
Actual Trend/Real Output (t-1)	-0.349*** (3.020)	
Real Exchange Rate	-0.279*** (3.726)	-0.468** (2.15)
Real Output		1.067*** (5.52)
Flow of Forex		0.587*** (5.52)
Dummy for 1986	0.156*** (3.073)	
Adjusted R^2	0.82	0.80
Durbin Watson	1.81	1.45

Note: All variables except dummies are in logs.

A one-shot <u>real</u> depreciation of 15% lowers private investment sharply but returns to the no-depreciation baseline level in two years. A similar pattern is obtained for the <u>gradual</u> real depreciation. However, the gradual

case implies a lower initial decline in private investment, a delayed recovery relative to the one-shot case: after the initial decline, private investment rises to equal the no-depreciation investment path in two and a half years. Though gradual depreciation retards the investment response relative to one-shot depreciation, in the medium term real depreciation encourages private investment.[25]

CONCLUSION

Failure to implement adjustment policies after the collapse of the coffee boom and the common market undermined private investment. Though Kenya has experienced relatively greater macroeconomic stability than other Sub-Saharan countries, her fiscal performance, both during and after the 1970s boom, leaves a lot to be desired. Her failure to control current expenditure has adversely affected public investment in infrastructure. It has also undermined her ability to reduce the fiscal deficit, and the money financing of that deficit. The latter in turn has reduced the flow of real credit to the private sector. Furthermore higher fiscal deficits arising from uncontrolled current expenditure has at worst generated pressures for raising

[25]A major qualification to this analysis in addition to the assumptions, lies in the fact that the reserve impact excludes fuel from both export and import, which has been an unstable factor in the actual path of Kenya's reserves.

import controls and has at best undermined credibility of trade liberalization.[26] Both enhanced uncertainty of private investors' access to imported capital goods.

Thus efficient fiscal adjustment and increased liberal import allocations will be critical to raising private investment in Kenya. Fiscal deficits should be reduced preferably through reductions in current expenditure that exceed reductions in total expenditure.

Such fiscal adjustment is likely to provide the biggest payoff in terms of private investment. It would raise public investment expenditure including that on infrastructure, and reduce money financing of deficit, both conducive to enhancing private investment. Furthermore, sustained trade liberalization would be facilitated by such fiscal adjustment which would in turn reduce uncertainty of access to imports for private investors.

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[26]Private investors may not respond to the liberalization-induced rise in profitability of tradable sector because poor fiscal performance raise serious questions about the sustainability of liberalization. Even if private investors do view the trade liberalization as credible increased fiscal deficits or lower infrastructure investment will have an offsetting negative influence on profitability of private investment.

Appendix

Data

We obtain data for all of the variables in expression (7). Fixed investment and GDP data are obtained from the Statistical Abstract. Public and private investment data in current and constant prices are used to compute the investment deflator for private investment at 1964 prices, the first year for which such data was available. Real private investment expressed as a ratio of real GDP is the dependent variable. The equipment component of private investment is the sum of private investment in machinery, transport equipment and other equipment. The building component includes residential, non-residential and other construction.

Various proxies are tried for income. Since the accelerator effect appeared weak in the more usual demand variables like real income level and growth in income, we try expected income growth and lagged real income growth.[27] Expected income growth was obtained by extrapolating income growth trend of three years (current and previous two years) to obtain year's income

[27]Regressing the real rate of private investment on the change in the log of income alone, gives a coefficient significant at the 95 percent confidence level and an R squared of 0.19. Regressed on the expected and unexpected portions of income growth, the coefficient of expected growth becomes significant at the 99 percent level, the coefficient of unexpected growth which is negative insignificant at the 95 percent level, and the R squared becomes 0.45. None of these coefficients are significant, however, when more variables are added to the regression analysis.

growth. However, it was not significant in most specifications.[28] Lagged income growth works best, though it is an unlikely proxy for expected demand.

Since data series on the lending rate of interest is short, we used the deposit rate of interest. Annex Figure A-1 shows that the lending and deposit rates are highly correlated (coefficient of correlation = .97). The real interest rate is obtained by subtracting the rate of inflation (i.e. changes in the GDP deflator) from the nominal deposit rate. Log of one plus the real interest rate is the variable we use for estimating expression (7).

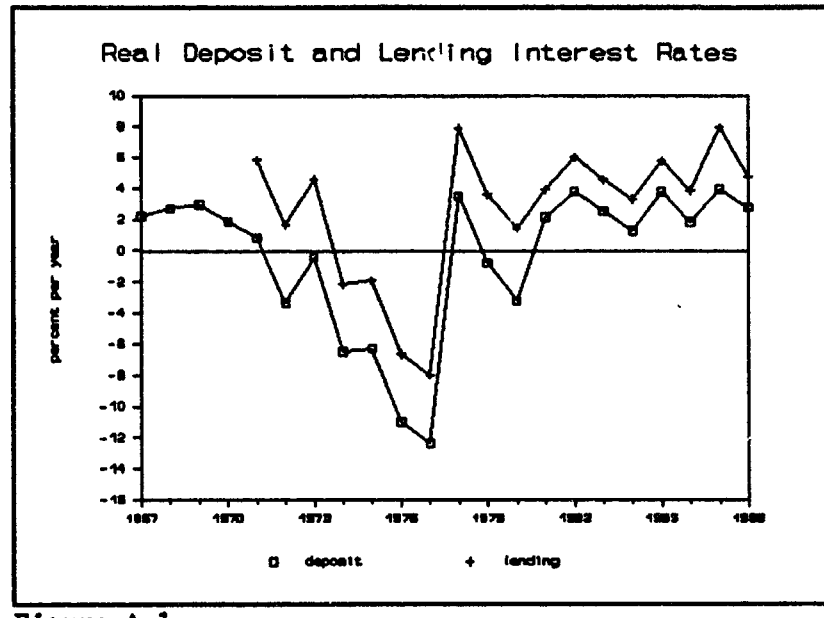

Figure A-1

The nominal value of the flow of credit to private sector is deflated by the GDP deflator to obtain real credit flow which is then normalized by the real GDP.

Real public infrastructure capital stock is calculated by assuming a 5 percent depreciation rate using the perpetual inventory method. Two public infrastructure series are constructed based on two public investment series.

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[28]We used only a three year trend because we wanted to conserve data points. The three year period moved. Thus the log of GDP in 1969 was predicted by the extrapolation of the 1966-68 trend regression. Expected GDP growth was the difference between this prediction and the log of actual GDP in 1968. The R-squared of the regression measured confidence in the prediction. Actual (log) GDP in 1969 less predicted GDP is unexpected growth. For 1970, we projected from 1967-69 data, etc.

The more inclusive of these series i.e. infra:broad accumulates investment in government services, building and construction, electricity and water and transport, storage and communications. The other i.e. infra:narrow excludes investment in government services. The real public infrastructure capital stock series is then normalized by real GDP.

To capture the effects of changes in import allocations, we try both the stock of reserves as well as the flow of receipts of foreign exchange. The beginning-of-year dollar stock of foreign exchange reserves obtained from the International Financial Statistics (IMF, various issues) is deflated by the import price index and expressed as a ratio to Kenya's 1980 dollar GDP, both obtained from World Bank data files. The reserves to GDP ratio both at the beginning of the year and those at the beginning of the previous year are highly significant. Since their regression coefficients are not significantly different, we thus conserve degrees of freedom by using the average of the two years reserves. We lag this to avoid simultaneity problems.

The real exchange rate index is the ratio of Kenyan CPI to a weighted average of partner country wholesale price indices. The weights are based on 1985 shares of the top twenty trading partners of Kenya. An increase in this index implies real appreciation.

The matrix of correlation coefficients among these variables are shown in the Table. The matrix of correlations of the private real investment rate and each of the explanatory variables show only three variables to be highly correlated with the rate of real private investment with simple correlation of 0.8: the real exchange rate, the stock of foreign exchange reserves and the flow of foreign exchange receipts. These three variables all have strong time trends through the 1970s. Only one pair of explanatory variables is highly

correlated, namely the current stock of foreign exchange reserves and the current real exchange rate probably suggesting that devaluations have been reserve driven contemporaneously. However, lagged reserves are not so correlated.

Table: Correlation Coefficients Matrix

	1	2	3	4	5	6			78910
1	1	0.48	0.84	-0.22	0.68	0.94	0.94	0.76	0.73 -0.44
2		1	0.28	-0.19	0.35	0.36	0.54	0.5	-0.54 -0.42
3			1	0.03	0.49	0.88	0.75	0.48	-0.63 0.40
4				1	-0.43	-0.23	-0.14	-0.36	0.20 0.24
5					1	0.62	0.64	0.44	-0.67 -0.57
6						1	0.85	0.69	-0.67 -0.39
7							1	0.73	-0.67 -0.39
8								1	-0.58 -0.34
9									1 0.89
10									1

Variable Names:

1 Real Private Investment/Real GDP
2 Real GDP Growth
3 Real Exchange Rate
4 Real Interest Rate
5 Real Bank Lending/Real GDP
6 Real Foreign Exchange Reserves/Real GDP
7 Flow of Real Foreign Exchange Earnings/Real GDP
8 Real Public Sector Investment/Real GDP
9 Real Public Infrastructure Capital (Board)/Real GDP
10 Real Public Infrastructure Capital (Narrow)/Real GDP

Note: All variables are in logs.

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